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HYDRO-ELECTRIC INQUIRY COMMISSION

ENGINEERING DATA

THE QUEENSTON-CHIPPAWA POWER DEVELOPMENT

CHAPTER "H"—CONSTRUCTION PLANT
TRANSPORTATION

WALTER J. FRANCIS & COMPANY

CONSULTING ENGINEERS



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Chapter H.

CONSTRUCTION PLANT

(Transportation)

Walter J. Francis.

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CORRESPONDED PLANT

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Chapter H.

CONSTRUCTION PLAKT

Walter J. Francis.

The first part of Chapter E, describing the sonstruction plant of the Hydro-Electric Fower Commission as used on the Queenston-Chippawa Fower Development, was devoted to the subject of the plant for concrete and reinforced construction. This part, the second of Chapter H, deals with the broad subject of transportation, transportation equipment and disposal areas. There are two other parts, called part 5 and part 4, the former of which, part 3, deals with earth and rock excavation in the Janal, while part 4 deals with a similar subject in relation to the Intake, the Welland Eiver, the Forebay, the Power Ecuse and the Tail-race.

THANSPORTATION.

Transportation Generally.

The transportation of men and material within the district of the meenston-Chippawa Fower Development, which includes an area, say, fourteen miles in length by three miles in width, was accomplished by three principal systems; namely: by automobiles, by water, and by a railway system. Speaking generally in the second of the second se the automobile system was used by the engineers in conducting the work and for the purpose of distributing stores and merchandise over the works, conveying repair gangs to and from shops to the various major machines where they were needed, delivering goods from the works to the railway stations and vice versa, fire service, ambulance service, and similar instances.

The water transportation was confined to the works on the Miagara River, the Intake and the Welland River, and is dealt with in part 4 of this Chapter.

The construction railway system was used for handling all material excavated in the dry and for the delivery of carload lots or train lots of construction material, construction plant and permanent machinery.

No horse-drawn vehicles very used in connection with the work, with the exception of a few waggons in the earlier stages. The greatest number of horses the Hydro-Electric Power Commission had on the work was fifteen teams. A few horses were kept for the occasional supply of water for boilers, and for odd jobs in the yards where they were more economical and more convenient than other means of traction. A limited number of teams were hired in the early construction periods for such work as clearing the right-of-way.

AUTOMOBILES.

Number and Class of Cars.

The automobiles used for transportation consisted of cars of two principal types, the first being a small runabout car carrying the driver and one

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passenger and the other class was of the lorry type. The first class of car was used by the engineering staff and by the construction superintendents. The lorries were principally equipped for carrying heavy materials, some of them having a capacity of 9 tons, and a small number were arranged with side seats for carrying numbers of workmen after the manner of an omnibus. In addition there were some special cars such as ambulances and a hose waggon for the fire brigads. There were also six tractors.

The fleet commenced with a small number of cars for the engineers, and was increased as the assume arose. The maximum number of cars in use was during the period of 1921.

The small runsbout our being unsuited to the purpose of Mr. Acres, he supplied his own seven-passenger touring car which he used throughout the period, being allowed nominal mileage therefor, and being charged with all gasoline and repairs while used on the work.

The number of trucks or lorries in service during the construction years is as follows:

Year	Aumber	Year	Muniper
1917	13	1920	42
1918	19	1921	55
1919	SKA.		

The disposition of the trucks at this date is as follows:

In service .			***	 	23
Being repair	red	245	****	 ****	6
In salvage	****	***	****	 ****	7
Bold					16
Transferred					3 55

The following table gives the principal data with reference to the cars in the fleet.

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Motor Trucks

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250 .	Mako	Capacity	Order No.	Date of Purchase	Service
1	White	4-ton	837	Sept. 1917	Hauling rook, ota
2	STAR	4-ton	837	Sept. 1917	Used with Trailer No. 236 for
	A 2010000 C 10	State All Spirit street	Manager 4	And the Parameter of the second of	hauling poles and lumber
15	Packard	1 -ton	1763	April,1917	General cartege
16	Prokurd	1 -ton	1785	April,1917	General partors
17	Psokard	1 -ton	1763	April,1917	Conoral cartage
10	Mark	1 -ton	1703	April,1917	General cartage
20	Packard	1 -ton	2042	July, 1917	General sartage
00	Packard	1 -ton	2042	July, 1917	Coneral cartage
30	Packard	1 -ton	1783	July, 1917	Ceneral cartage
51	Packard	1 -ton	2042	July, 1917	Comerci cartage
35	Prokura	2-ton	1703	July, 1917	Comeral cartage
36	Packard	a-ton	1783	July. 1917	General cartage
15	Roo	3/4-ton	21.05	July, 1917	Garage service truck
45	Packard	1 -ton	3175	April, 1918,	Passenjer sorvice
46	Pankani	2-ton	3175	A (ril, 1918 Y	General cartage
48	Packerd	3-ton	Stalle	April, 1918	Loose material
49	Packard	3-ton	3000	April,1918	Loose material ************************************
EOS	Rec	3/4-ton	3230	April,1918	Slectrical operating
235	Packurd	4-ton	3919	Oct. 1918	Loose material **********
238	E00	3/4-ton	4853	July, 1919	General cartage ************************************
241	Reo	3/4-ton	4940	Sopt. 1919	General cartage **********
From the top	Reo	3/4-ton	4540	Dec. 1919	General cartage **********
245	Hoo	3/4-ton	5214	Dec. 1919	Shovel service ************************************
247	Reo	5/4-ton	5214	Dec. 1919	Stores Department
246	Neo	3/4-ton	5214	Dec. 1919	Landys Lane Detour Pass
249	Meo	5/4-ton	5214	Dec. 1919	General cartage
251	1:00	3/4-ton	5214	Dec. 1919	General cartage **********
252	Reo	3/4-ton	5:14	Dec. 1919	General cartage
253	Rec	3/4-ton	5714	Dec. 1919	General cartage ************************************
254	Rec	5/4-ton	5214	Dec. 1919	General cartage ************************************
255	Packard	2-ton	5275	Dec. 1919	General cartage ************************************
256	Fackard	1,-ton	5275	Feb. 1920	Power House construction
257	Rokard	1,-ton	5275	Jan. 1920	General cartage
263	Reo	1 -ton	937	Oct. 1920	Engineers Division 3
264	Reo	1 -ton	937	Oct. 1920	Landys Lane Detour Pass
265	Roo	1 -ton	937	Oct. 1920	General cartago
266	Reo	1 -ton	937	Oct. 1920	Engineers Division 2
267	Reo	1 ton	937	Oct. 1920	General cartage ***********
269	Reo	1-ton	1209	Hov. 1920	General cartage ************************************

for Ceneral Service

	Fz	Timo :	in (iervice" To	Remarks
**	Sept.	1917	tod volle. No ne oblige d	March, 192	5 Still in sorvice.
谦 迪	Sept.	1917	446	March,192	Still in service.
-	Arri	.,1917	.000	Nov. 1923	The state of the s
	A ril	.1917	1966	Dec. 1921	
* 0	April	,1917	2010	Nov. 1921	Sold.
**	April 1	,1917	400	Dec. 1923	Transferred to Toronto Garage.
**	July,	1917	deliter	Dec. 1921	
事等	July,	1917	4400	Nov. 1923	Sold.
	July.		1990	Nov. 1921	Sold.
**	July,	1917	1980	Nov. 1921	
-	July,	1917	3400	Nov. 1921	3014.
* *	July,	1917	shelic	Nov. 1921	Bold.
**	July.	1917	1986	Feb. 1922	Wrecked (to be rebuilt).
*	April	,1918	mir	March, 1922	Atil in gervice.
**	April	,1918	16401	Nov. 1921	
軍事	April	,1918	near	March, 1923	Still in service - (dump truck).
	April		aute	Oct. 1921	
*	April	,1910	-	Jan. 1922	
**	Oct.	1918	spin-	April, 1922	Sold - (dump truck).
*	July,	1919	min	Dec. 1931	
6 6	Sept.	1919	4904	Nov. 1921	Transferred to Toronto Garage.
	Dec.	1919	000	Nov. 1921	Salvage Department.
	Dog.	1919	Aller	Dec. 1921	Sold.
	Dec.	1919	9949	Pob. 1922	Sold.
*	Doo.	1919	-	Jan. 1923	Still in service. At Garage.
	Doo.	1919	4600	Mov. 1921	Salvage Department.
-	Dec.	1919	- OOK	March, 1923	
	Doc.	1919	1005	Merch, 1923	
	Dec.	1919	10000	June, 1922	
	Dec.	1919	***	March, 1923	Still in service.
	Dec.	1919	ajio .	Nov. 1922	Salvago Dogartmont.
	Fob.	1920	ypulli.	March, 1923	Still in service.
	Jen.	1020	nigo	elektrizing are situ denerally with on Belindrik	Still in service.
	Oct.	1920	100	Maroh, 1923	Still in service.
	Oct.	1920	2000	Feb. 1923	Undergoing overhealing.
	Oct.	1920	****	Jam. 1922	Being rebuilt.
	Oot.	1920	698	Maroh,1923	Still in service.
	Oct.	1920	-964	March, 1923	Still in service - (nights).
6	Hov.	1920	, makes	Dec. 1922	Being rebuilt. (Insurance Account).

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Hotor Trucks for

No. Make	Ompacity	Order No.	Date Puro	of hese	Service	
		1\-ton	1289	Feb.	1921	General cartage
271	Rec	13-ton	1289	Feb.	1921	General cartage
272	Reo	1 -ton	1289	Feb.	1921	General cartage ************************************
273	Rec	1 -ton	1209	Feb.	1921	Rump and pipe line maintenano
274	Roo	1 -ton	1289	Peb-	1921	Power House operators *******
275	Oldemobile	1-ton	1228	Jen.	1921	General cartage ************************************
276	Oldsmobile	1-ton	1226	Jan.	1921	General cartage
278	Packard	li-ton	1641	April	.1921	Express and freight
279	Rugles	2-ton	1640	May.	1921	Coneral cartage
280	Rusgles	2-ton	1640	May.	1921	General dartage
281	Rugglos	2-ton	1640	Hay.	1921	General cartage
282	Ruggles	2-ton	1640	May.	1921	General cartage

COPY

Miscellaneous

No.	Make	Capacity	Order No.	Date Puro	of haso	Service
237	Packard	5-Russencer	4484	Peb.	1919	Ambulance service
244	Reo	3/4-ton	4940	Dec.	1919	Mospital service
250	Reo	3/4-ton	5214	Dec.	1919	Fire truck *************
277	Packard	5-Passenger	1641	May,	1921	Ambulance service
3	The state of the s	Tractor	-	e .	* * * * *	Railway Construction Dept
4		Tractor				Railway Construction Dept
5		Tractor				Railway Construction Dept
6		Tractor				Railway Construction Dept
-	Holt	10-ton Catar	Texa			
	seconds and all	pillar Tract	or 134	March	1917	*******
	Holt	10-ton Cater				
	-	pillar Treet		March	1,1917	************
236	Troy Tre	44	4160	Dec.	1918	****

^{*} Figured from actual date of urchase whether or not the truck or car was delivered now to the Miagara work. A considerable master of these trucks were not so delivered. For instance six Packard Trucks, including all the Packard Duma Trucks, were used on the Ontario Power Company extension work before being assigned to the Cusenston-Chip and Power Development work.

General Service (continued)

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inalise and construction of	Time From	ini	ervice* To		
	Feb. 1921 Feb. 1921 Feb. 1921 Feb. 1921 Jan. 1921 Jan. 1921 April, 1921 May. 1921		March,1923 March,1923 March,1923 March,1923 Mov. 1921 Dec. 1921 March,1923 March,1923 Dec. 1921	Still in service. Salvage Department. Salvage Department. Still in service. Still in service. Still in service.	объембы и не и по
·安安	May, 1921 May, 1921		Dec. 1921 Dec. 1921	Sold. Sold.	
	Automotive Timo From	to all the second second	ijmint ervice* To	COPY	eligin - ungwerelle un gebor nauem verschen versche volge v. zein ver vinge versche ve
	Feb. 1919 Dec. 1919 Dec. 1919	-	March, 1923 Dec. 1921 March, 1923 Warch, 1923	Still in service. Salvage Department. Fire protection.	gen-derficige of the anti-antiferral derivatives (derivatives) and the second derivatives are second derivatives and derivatives are s

.. Feb. 1919 - March, 1923 Still in service.
.. Dec. 1919 - Dec. 1921 Salvage Department.
.. Dec. 1919 - March, 1923 Fire protection.
.. May, 1921 - March, 1923 Still in service.
.. May, 1918 - June, 1922 Salvage Department.
.. Salvage Department.
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NAME OF BRIDE THE PERSON NAMED IN COLUMN TWO IS NOT THE OWNER. principal to \$50 miles All the same of the same of THE PART OF THE PA TOL ...

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Passonger

No.	Lake	Description	Order No.	Date Puro		Assigned to 1921
107	MoLeuhlin	Roadster	3231	May.	1918	Master Mechanic
142	McLauhlin	Roadster	4851	July.	1919	
143	McLaughlin	Roadster	4851	July.		***
148	Overland	Romintor		77 16	1920	
151	McLaughlin	Roadster	5155	Nov.	1919	
152	McLauchlin	Rosulster	5155	No v.	1919	
156.	Chevrolet	Roadet er	5363	Feb.	1920	
157	Uhovrolet	Roadster	5363	Feb.	1920	
159	Chevrolet	Roadster	5363	Peb.	1920	
162	McLaughlin	Touring	187	May,	1920	
163	MoLeaghlin	Touring	347	June,	1920	
166	Chevrolet	Roadster	348	July.	1920	Spare
167	McLaughlin	Roadster	347	June,	1920	
168	McLanchlin	Rosdeter	347	Juno,	1920	
				0	0	V Rquipment
169	McLeughlin	Roadster	347	June,	1920	Superintendent of Railsay Con-
d	6.1. 111		-			struction and Maintenance
170	McLaughlin	Roadstor	347	June,	1920	Chief Hydraulic Engineer, and
						Spare *******************
171	McLaughlin	Roadster	347	June,	1920	General Superintendent of
						Construction
172	Chevrolet	Roadster	348	July.		Resident Exgineer, Division 4
173	Chevrolet	Roadstor	348	July,		Resident Engineer, Division 1
174	Chevrolet	Roadster	348	Aug.	1920	Master Slectrician
175	Chevrolet	Rondster	600	AUG*	1920	Superintendent of Sanitation
176	Chevrolet	Roadstor	1130	Th.	1920	Superintendent of Operation
177	Chevrolet	Roadster	1130	June,		Assistant Rydraulic Engineer
178	Chevrolet	Roadster	1132	Jumo,		Chief Field Engineer
179	Chevrolet	Roadster	1132	June,		General Line Forman
	Axcelsior 1	iotor Cycle		May.	1918	Timekeeping Department

Note:

The above list constitutes the maximum number of passenger cars in use at any time on the Queenston-Chippawa Power Development; twenty-three cars in continuous service. sixteen under the jurisdiction of Works Engineer, seven directly under the control of Ferento Office, and two spares.

Motor Cars

	There Used 1921	Assignad to -	Where Used 1923
* 4 4	Whole works	Resident Engineer, Division 2.	Canal
	Whole works	Assistant Field Engineer	Whole works
***	Hospital	Superintendent Automotive Equipment	Whole works
	Power Rouse	3014	and the second s
	Canal	Sold	
	Whole works	Flant Engineer	Whole works
***	Salvage Dopt.	Superintendent of Operation	Power House
4 4 4	Intake and River	Resident Slectrical Engineer	Power House
	Hospital	Resident Engineer, Division 1.	Intake
***	Hospital	Chief Medical Officer	Whole works
	Whole works	Visitors and General Service	Whole works
6 4 4	Whole works	Assistant Hydraulic Magineer	Whole works
***	Whole works	Being rebuilt	
	Whole works	General Supt. of Canal Construction	Canal
* * *	Whole works	Master Mechanic	Whole works
	Whole works Power House	Being rebuilt Deing rebuilt	
	Canal	Supt. of Power House Construction	lower House
	Whole works	Master Blectrician	Whole works
,	Whole works	Being rebuilt	What a second
	Power House	Chief Field Engineer	Whole works
	Whole works	Assistant Superintendent of Construction First Aid Officer	Whole works
	Whole works	Resident Engineer, Division 4.	Power House
***	oemer.	Salvago Department	enn as much

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Roadways.

The automobiles were used chiefly on the public highways in the vicinity and to some extent along the construction trails in the vicinity of the work.

Garage.

The headquarters of the fleet were on Stanley Street in the heart of the operating district. The cars were under the control of the superintendent of Divisions2 and 3. Mr. Fred W. Scriven, who directed the service through the garage superintendent. The garage costs were recorded by clerks in special charge of the work, who reported to the cost clerk, Mr. Arthur G. Bradley. At the headquarters supplies of gasoline and oil were kept and supplied for the cars under definite governing rules. Repairs to the cars were also done at the garage and a regular record thereof was duly kept.

WATER TRADSPORTATION.

General.

For the work on the Miagara River, the Intake, and the Velland River, launches and scows were used for transportation. The details of this transportation will be taken up in that part of Chapter H referring to the earth and rock expansion of the Intake and the Welland River.

Since the filling of the Canal in December of 1921, the launch "Malinche"

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has been used for inspection in traversing the whole length of the Canal.

CONSTRUCTION RAILWAY.

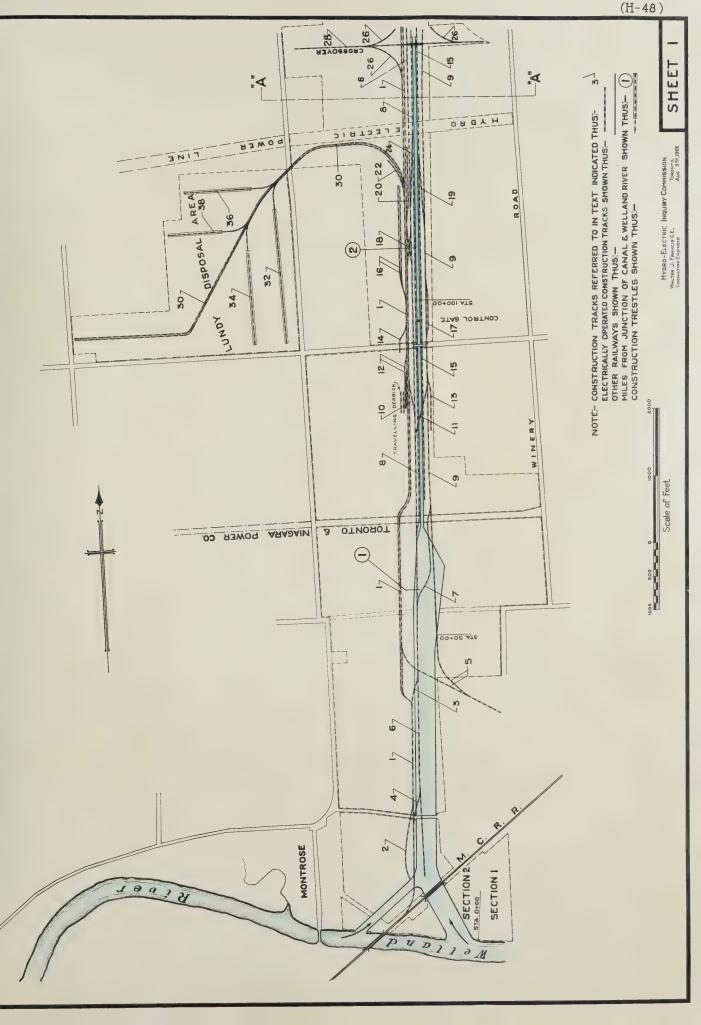
General.

The construction railway system was the most important of the transportation elements. It comprised in all over seventy miles of standard gauge track and switches and was operated by electric locomotives as well as by steam power, the former being capable of a speed of 15 miles per hour with a loaded dirt train of eight cars. The eight page now following, being pages H-47 to H-54 hereof, show the complete system, the first six pages being plans, and the last two prefiles. In addition to transporting about sixteen million cubic yards of earth and rock excavation, all the raw materials for concrete work and all the major items for the construction plant, as well as for the permanent work, passed over the system.

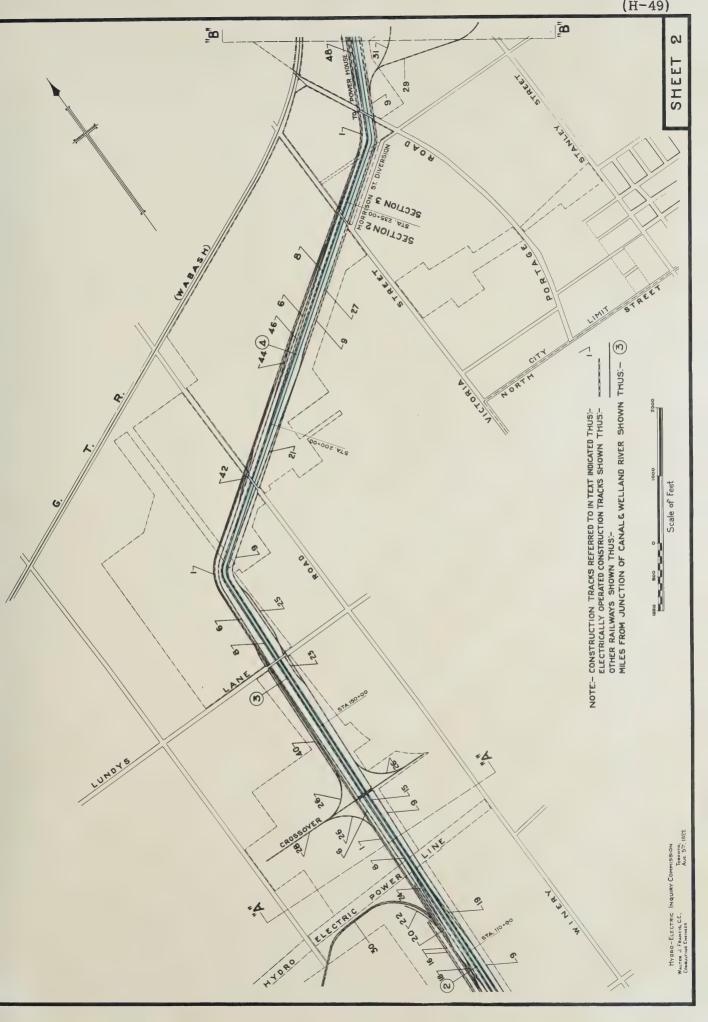
The traffic on the main line tracks was very heavy, the maximum density of traffic obtaining in the vicinity of the disposal "I" just prior to the opening of the Lundys Lane disposal area. At that time the interlock tower at the "Y" reported as many as one thousand train movements in twenty-four hours, being an average of one train every ninety seconds. Later, the movements frequently exceeded five hundred per day. As an example, the train sheet for February 24th-25th, 1921, typical of the train work of the period shows the following movements:

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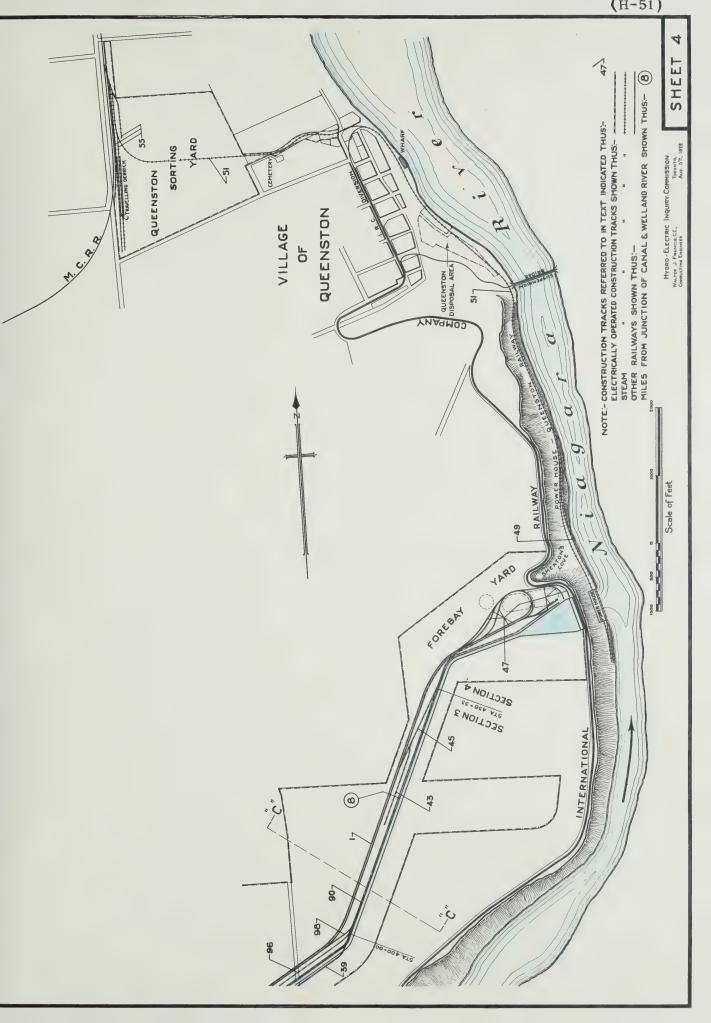






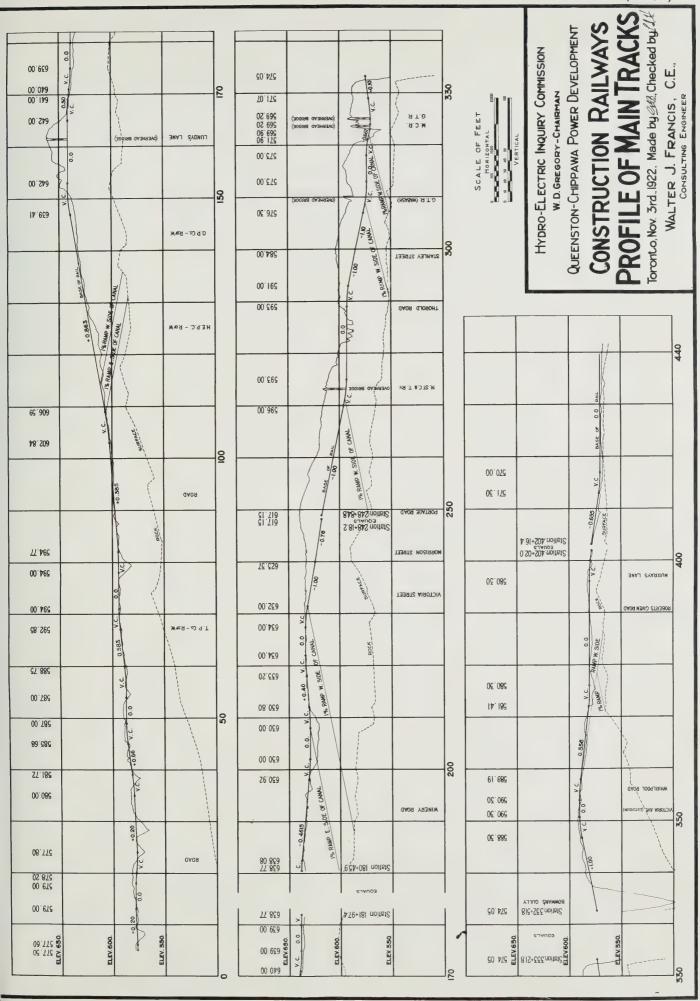




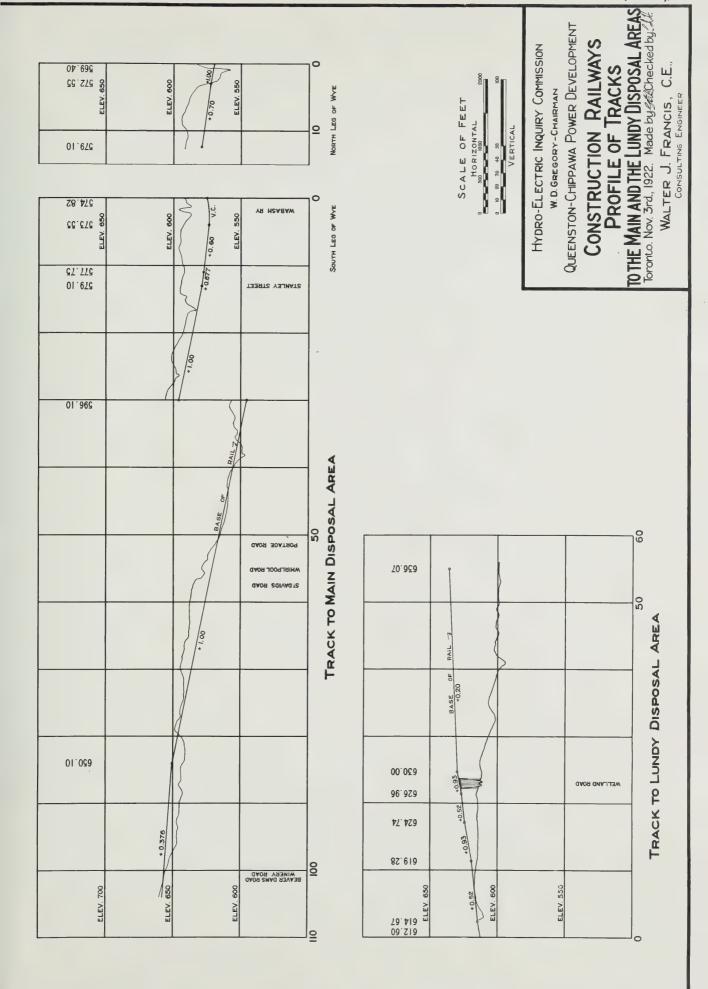














Sout and	Dirt	Prai	ns .	*******	236 movements
				********	76 movements
Work Train	as (20)	al Br	ritah	075 *****	6d movements
Speeders	***	***	***	******	30 movements
Total	for	the	day	*****	408 movements

Historical Notes.

The survey for the construction railway commenced on November 22nd, 1916. The work on the railway construction was first confined to that portion of the system lying to the north of the Grand Trunk Railway, the crossing of which the Sydro-Electric Power Commission experienced difficulty in obtaining. The first work train service for his impedienced difficulty in obtaining. The first work train service for his impedienced on May 17th, 1917, while the construction of the railway yards began on June 1st, 1917. The railway was in constant use throughout the construction period, and the dismantling of parts of it began immediately after the water was turned into the Canal in December, 1921. The dismantling has proceeded until only a comparatively small portion of the construction tracks now remain.

Persanent Trucks.

The portion of the construction railway system lying between the Michigan Central Railroad yards at Queenston and the Power House will be left for the permanent service of the Power House. It will also serve its purpose in connection with the completion of the construction of the Power House.

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Switching.

The operation at the most congested part of the system was controlled by interlocking switches with standard signal towers and apparatus. The photograph on page H-57 illustrates the control apparatus and shows also a diagram of the interlocking system.

Alignment and Gradients.

The alignment and gradients used throughout the system conform to standard railway practice as far as it could be adopted. The sharpest curves on the principal parts of the system have e radius of \$65 feet, while none of the grades exceed 1 per cent. For main line construction, 85 pound rail is used.

The six photographs included as pages H-50 to H-60 hereof show typical construction of the system.

The Lay-out of the System.

The general map included herewith as page H-47 shows the plan of the district, and is intended for use as a key map to the five sheets which follow it, being pages H-48 to H-52 inclusive, and which show the detail lay-out of the system.

The profile of the main tracks is shown on page H-53 hereof, and all the bridges are indicated thereon. The succeeding page, being H-54 hereof, shows the profile of the tracks leading to the main disposal area and to the Lundys Lane disposal area.

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COPY FOR ENCLOSURE TO Mr. J. Allan Ross.

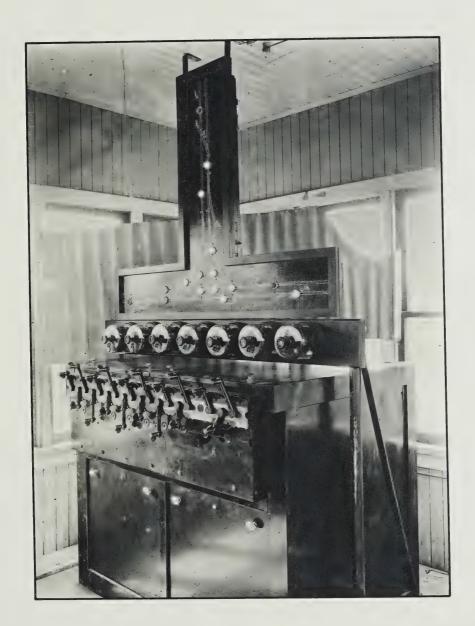
To face page H-57

No. H-24

Photograph showing

Interlocking Wachine and Chart.

Taken August 4th, 1920.







COPY FOR ENCLOSURE TO Mr. J. Allan Ross.

To face page H-58

No. H-25

Photograph showing

Construction Railway,

looking south from Lundys Lane Crossing.

Taken December 2nd. 1920.

COPY

No. H-26

Photograph showing

Construction Railway: Loading Track Supported on Piles.

looking south from Station 72.

Taken May 3rd, 1921.







COPY FOR ENCLOSURE TO Mr. J. Allan Ross.

To face page 3-69

No. H-27

Photograph showing

Fower House-Jusenston Bailway Subgrade.

looking north from Station 18.

Taken September 5th, 1919.

COPY

No. H-28

Photograph showing

Power House-Queenston Railway: Preparation of Subgrade.

looking south

Taken August 9th, 1919.









COPY FOR ENCLOSURE TO Mr. J. Allan Ross.

To face page H-60

Ko. H-29

Photograph showing

Construction Bailway,

looking north from Landys Lane Detour, West Side.

Taken October 3rd. 1919.

COPY

No. H-30

Photograph showing

Power House- weenston Railway,

looking south from Station 13.

Taken November 7th, 1919.







The following table is a summary of the lengths of the principal tracks of the system.

Queenston-Chippawa Fower Development Construction Railway System Surmary of Length of Tracks

Classifi	oation	Total	Lineal	Feet
Main Tra	oks	* * * * *	83,900	entilityt ett helle vii kan
Disposal	Tracles:			
**	dys Lane	*****	20,550	
	etery		2,800	
	noipal Area		38,800	
SV)n 4	rlpool C. O. D.V.	******	2,500	
Men ve	ray's Land	*****	1,300	
	enston		4,000	
4640	315 to 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	*****	-	
Loading	Trucks - West Side		36,400	
	Tracks - Mast Side		11,200	
Ramp Tra	cks - West Side		13,300	
	cks - Mast Side		3.700	
Rip-rap	Tracks - West Side		26,600	
	Tracks - Hast Side		33,699	
Connecti	on with Niegara, St. Cati	h-		
	s and Toronto Railway		400	
Yard Tra	oks - Whirlpool		16,100	
	cks - G.T.R. Transfer		7,700	
Bard Tra	oks - Forebay	******	8,650	
Power Ho	use - meenston hailway		22,750	
Miscella	neous Tracks		42,750	
		4	378 000	lineal feet
			770,000	TTURES TOOL

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The detail of the various tracks is given in the following table:

Construction Line

	Number on Flan	Lineal Lineal Feet Feet Single Double Track Track		Total Lineal Feet	
Main Tracks					
M.C.A.A. connection at Mon-		3.600		¥.600	
Sta. 42 to Sta. 443+50		0,000	40,150	80,300	83,900
Disposal Tracks					
Landys Lane:			da dis da da		
Main Tracks, Sta.115 to			6,900	13,800	
Spur Tracks		2,400		2,400	
Spur Tracks		1,800		1,800	
Spur Tracks		1,200		1,200	20,550
Spur Tracks	55	1,350		1,350	eu , pou
Cemetery:					
Main Spur. Sta. 251 to en		2,000		2,000	
Spar заселения в в в в в в в в в в в в в в в в в в в	31	800	*	802	2,800
Principal Area, Westerly					
from Sta. 315:					
"Y" Tracks	54		2.000	4,000	
"Y" Tracks to centre lin					
of Beaver Dams Road .			8.900	17,800	
Spur Tracks (six)		17,000		17,000	38,800
Whirlpool:					
Sta. 335	37	2,500		2,500	2,500
Sta. 372 (Bast Side)	41	1,300		1,309	1,300
Loading Tracks (West Side)					
Sta. 64 to Sta. 322	** 8	25,800		25,800	
Sta.354 to Sta. 480	90	10,600		10.600	36,400
Cr	erried forv	ward	******		186,250

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Construction Line (continued)

Classification	Aeference Ember on Plan		Lineal Feet Single Track	Lineal Feet Double Track	Total Lineal Feet	
Brought forward						186,250
coding and Construction Track						
(East Side)	7 6		19 9 45.74 74		13 900	李维 化硫
Sta.70 to Sta.182	15		11,200		11,200	11,20
demp Tracks (West Side)						
Sta.114 to Sta.125	24		1,100		1,100	
Sta.195 to 3ta.231	46		3,600		3,600	
Sta.250 to Sta.271	48		2,100		2,190	
Sta.290 to Sta.309	50		1,900		1,900	
Sta.311 to Sta.322	52		1,100		1,100	
Sta.360 to Sta.387	1 53	V	2,790		2,700	
Sta.367 to Sta.375) DE	Y	800		800	13,39
Samp Tracks (Rast Side)						
Sta.110 to Sta.122	19		1,200		1,200	
Sta. 182 to Sta. 207 *********	21		2,500		2.500	8,70
fon of Bank, Rip-rap Tracks						
(West Side)						
Sta.14 to Sta.248	á		22,900		22,900	
Sta.328 to Sta.365	80		3,700		3,700	26,60
Fon of Bank, Rin-rap Tracks						
(East Side)						
Sta.46 to Sta.295	9		24,900		24,900	
Sta.511 to Sta.522 ***********************************	35		1,100		1,100	
Sta.324 to Sta.400	39		7,600		7,500	33,50
Connection with N.St.C. & T.A.						
(East Side)	Lines, Cold		4.00		76 on 16	
Sta.272	33		400		400	40
Mirlpool Yards						
Spar off M.C.M.R	74		2,000		8,000	
Spar off Disposal Track	58		2,500		2,500	
Tracks through Building No. 57	60		3,000		3,000	
North of Building No. 120	72		1,700		1.720	medically do story where
- Ca	rried	forw	ard	*****	9.200	275.05



Construction Line (continued)

Classification	N	erence umber Plan	Lineal Feet Single Track	Lineal Feet Double Track	Total Lineal Feet	
Brought forward					9,200	275,050
Whirlpool Yards (continued)	7	74.75	3 750		1 750	
Through Machine Shop, Nain Trac		70	1,350		1,350	
Tracks		56	1,200		1,200	
Around West Side Machine Shop .		68	2,100		2,100	
Around East Side Machine Shop .		64	1,650		1,650	
West of above	*	62	600		600	16,100
.T.R. Transfer and Yard						
Transfer Track	•	78	3,400		3,400	
Shed	2) •	84	1,800		1,800	
Tracks North of Trans of Track	P	86	2,500		2,500	7,700
Forebay Yards						
All Tracks	*	47	8,650		8,650	8,650
Power House, - weenston Mailway						
Main Line (Single Track) Branch, Low Level, East of		51	14,250		14,250	
Power House	- 10	49	3,350		3,350	
Sorting Yard		£5	5,150	,	5.150	22,750
iscellaneous Tracks						
Sta. 20. Track to Coal Dock.						
West Side		- 2	1,200		1.200	
Sta. 25, Crossover		4	800		800	
Sta. 42. Crossover		3	600		600	
Sta. 44. Crossover, Canal and	*	0	300		900	
Switchback		5	2,700		2,700	
Sta. 60, Crossover Canal		7	-		1,600	
· · · · · · · · · · · · · · · · · · ·			1,500		800	
Sta. 85, Crossover Canal		11			800	
Sta. 35, Orossover		10	800		933	
Sta. 85, Spur Conl Contle		13	900			
Sta. 85, Tracks to Soal Trestle Sta. 95, Track: to Transformer		12	1,400		1,400	
Station Sta. 95, Passing Track, East	*	14	400		400	
Side starte		17	900		900	a collection of the sales of the sales
Carrie	ed f	orward			12,100	330,250

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Construction Line (continued)

Classification	Number on Plan	Reet	Feet Lineal Double Feet Track	ernalikk ernskarnalikjarnopsk, sudak entimpussion
Brought forward			12,100	330,250
scellaneous Tracks (continued)				
Sta. 99, Storage Tracks, West	9 27 mg m	W 500	THE SHIP OF ME DAM	
Side	16	3,200	3,200	
Sta. 107, Double Crossover Sta. 112, Storage Track, West	18	1,000	1,000	
Side	20	1,150	1,150	
Sta. 115, Salting and Oiling	grand (Bullion Control of the Control	
Track	22	800	800	
Sta. 138, Crossover Canal	28	2,800	2,800	
Sta. 138, Three Wye Tracks	25	2,500	2,500	
Sta. 150, Sand and Stone Stora	80	•		
West Side	D43/	2,500	2,500	
Sta. 160, Passing Track Batt				
Side	23	700	700	
Sta. 170, Passing Track, East				
Side	25	1,000	1,000	
Sta. 190, Crossover, West Side		700	700	
Sta. 210, Crossover, West Side	44	1,000	1,000	
Sta. 211 to 262, Passing Track	T A 2 Magazine P	*** * * * * * * * * * * * * * * * * * *	# 200	
East Side	27	5,100	5,100	
Sta. 341, Spur, West Side	78	500	500	
Sta. 350, To Concrete Mixing	0.0	1 000	3 303	
Flant, West Side	82 95	1,000	1,000	
Sta. 390, Spur, West Side Sta. 400, Crossover, West Side	98	500	1,600	
Sta. 420, Rip-rap, West Side .	43	1,300	1.300	
Sta. 430, Crossover, West Side	45	1,300	1,300	
To Band Pit, off North Bound	- 10 m/s	* 4000	2,000	
Track to Frincipal Disposal				
Area	102	2,000	2,000	42,750
PN /9		eet heren in		373,000

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Main Line Tracks.

The main line tracks consist of a double track, standard gauge, electrically operated line, marked 1 on the plans, constructed along the westerly bank of the Canal from a point near the Welland Liver northerly to the Forebay. These tracks were used for general construction service, for the handling of work trains, and for the distribution of material and so forth. To facilitate operation, cross-over tracks were laid at convenient points connecting the northbound and southbound tracks.

Fower House - Incompton light PY

The part of the system known as the Fower House - Amenaton Hallway, at the general level of the operating floor of the Fower House, is a single track, standard gauge, steam operated line, denoted by the figure 51 on the plans. It commences at the Fower House, skirting the edge of the Miagara River to Queenston and continues westerly to a junction with the Michigan Central Railroad, Miagara Branch, to the south of the Village of Amenaton. This part of the system is indirectly connected with that of the upper elevation of the works. At a point about 2,000 feet northerly from the Fower House, a spur was constructed southerly, past the face of this structure with a tail track and switch returning to the southerly face of the building. Spoil from the Fower House excavation was carried over this track to a disposal area at Queenston, structural steel and other material with the exception of concrete, for use in the construction of the building, and later the permanent equipment of the plant was brought to the

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 site over this track.

The track will be retained as a permanent connection with the Michigan Central Mailroad for the Power House service.

The tail track now enters the scutherly end of the Fower House, through a temporary doorway, the sill of which is at Elevation 284, being the floor elevation at the base of the service units. It is the intention when the Fower House will have been completed, to form a doorway at the northerly end of the Fower House with the sill at Elevation 297.25 on the main operating floor, and to use this entrance for the railway siding in order to obviate the possibility of difficulty with the lower entrance in the event of a rise in the tail water as a result of an ice jam ()

At a point about 700 feet northerly from the boat wharf of the Canada

Steamship Lines at Queenston, the International Hailway Company forms a junction with the Fower House - Queenston Railway, and an agreement covers their use of this track for access to the wharf. This arrangement is in lieu of a part of the original line now abandoned, the right-of-way forming a part of the Queenston disposal area previously mentioned.

Transfer Connections with Other Railways.

As previously noted, the Power House - Queenston branch has a transfer with the Michigan Central Mailroad near Queenston. There are four other transfer connections with other railways as follows: to the Michigan Central Mailroad near Montrose by a single track on the double track construction railway already referred to, approximately 3,300 feet long; to the Siagara branch of the

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Michigan Central Railroad at the Whirlpool yards there is also a connection indicated by the numeral 74 on the plans; to the Grand Trunk Railway at Station 560 on the canal chainage a connection is made with a track from the main line construction track denoted by the number 78 on the plans; with the Riagara, St. Catharines and Toronto Railway by a connection at Station 272 from the riprack at the east bank of the Canal denoted by the numeral 33.

Tracks to Disposal Areas.

A double track, electrically operated line, denoted by the numeral 30 on the plans, branches from the main construction tracks at Station 115 and continues in a westerly direction to and through the Lundys Lane disposal area about one and one-third miles. Four tracks were carried over this area on temporary unloading treatles from which the spoil was distributed. Trolley wires were supported on temporary standards of frame construction shifted when necessary.

A spur about one-half mile in length, denoted by the numeral 23, extending easterly, branches from the track at the top of the east bank of the Canal at Station 251 for the cemetery disposal area. Off this spur there is a branch, denoted by the numeral 51, 800 feet in length.

Access to the main disposal area, situated about one and three-quarter miles north-westerly from Station 515, is obtained over an electrically operated double track, denoted by the numeral 51, branching from the main tracks through the north and south tracks on a "Y" at Stations 522 and 510 respectively, and terminating in six spur tracks, denoted by the numeral 100, carried over the

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area on temporary unloading treatles. The trolley wires were supported as in the case of the Lundys Lane disposal area previously referred to.

The single track line, denoted by the numeral 37, was constructed to encircle an area lying south-easterly from the canal site at Station 350 known as the Whirlpool disposal area or Borman's Gully.

A single track spur denoted by the numeral 41, 1,300 feet in length, was constructed in a neuth-easterly direction for the disposal of spoil in the Murray's Lane disposal area.

Track to Sand Fit. COPY

From the west bound track serving the main disposal area about one and one-half miles from its junction with the main construction track, a spur track, denoted by the numeral 13£, extends in an easterly direction about 2,000 feet to a sand pit and hopper situated in Lot 25, County of Stamford.

Ramp and Loading Tracks.

For handling the rock excavation from the shovel dippers, a loading track denoted by the numeral 8, was constructed at the westerly edge of the Canal along the 13-foot berm of the natural rock surface. This line was electrically operated and began at Station 70 of the canal chainage near the northerly end of the earth section continuing to Station 322 near the southerly end of the Whirlpool section, beginning again at Station 354 at the northerly end of the section and continuing to the Sorebay. At convenient points remp tracks

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constructed on one per cent. maximum grade were built to connect the loading track with the double track main line above. The ramp tracks were located having in mind the conformation of the natural rock surface giving the least possible longth of ramp with a one per cent. grade. The rock spoil was loaded directly into the cars of the dirt trains standing on the loading track. The dirt trains were moved car by car to suit the convenience of the shovels, and when fully loaded were hauled up the ramps to the souble track main line and thence to the disposal area.

Beginning at Station 70, near the northerly end of the earth section, a track denoted by the numeral loss pocated on the 10-feet berm of the easterly side of the Canal and continued northerly about two miles, thence up a one per cent. ramp to a junction at Station 207 with the general service track at the top of the bank.

At Station 122 a ramp 1,200 feet in length also provided access to this track from the general service track. This track was used to a great extent during the concrete construction work of the canal floor and lining.

Rip-rap and Loading Tracks.

Extending along the top of the bank and both sides of the Canal, tracks were built primarily for loading purposes, and were also used for unloading spoil from the rock section to be used as rip-rap. It was found necessary generally to follow up the shovels closely with the rip-rap deposit. As a convenience, these tracks were popularly known as the "rip-rap tracks".

The rip-rap tracks on the westerly bank are shown on the plan by the numerals

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6 and 80, while those on the easterly bank are numbered 9, 35 and 39.

Yard Tracks.

The Whirlpool yards were the principal yards used during construction. They were located on the westerly side of the Canal opposite Station 525 in part of Lots 42 to 57. County of Stamford, and lying between the main track leading to the main disposal area and the tracks of the Michigan Central Railroad. There were entrances to the yard from the disposal area tracks and from the Michigan Central Mailroad tracks. In the Whirlpool yards were located the locomotive sheds, car repair shop, machine shop, main storehouse, miscellaneous storehouses and other buildings. The tracks serving the several facilities are indicated on the plan by the following numbers: 58, 60, 62, 64, 66, 68, 70, 72 and 74, track 58 being the entrance to the yard from the disposal area tracks, and track 74 entering the yard from the Michigan Central Railroad.

From the track indicated by the numeral 78, being the connection with the Grand Frunk Railway at Station 356 in the district of the Whirlpool yards, there are tracks, denoted by the numeral 84, serving two large cement storage sheds. An additional track, denoted by the numeral 86, branching from the south-bound main construction track at Station 360, parallel to and about 200 feet northerly from the transfer track, serves three cement storage sheds.

The Forebay yards are located immediately to the north of the Forebay and form the northerly terminus of the double track main system. In these

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yards are located the primary and secondary crushers, the stone screen and bins, the sand storage and mixing plant conveyors, a cement shed, a storage building and a machine shop. There were also large areas reserved for the storage of one-inch and two-inch crushed stone. The tracks serving the various facilities are indicated on the plan by the reference numeral 47.

A sorting yard was established at the junction of the Power Housequeenston Railway with the Michigan Central Railroad, Niagara branch, and storage houses were built for materials to be used in the construction of the Power House. A travelling derrick was also erected at this point for unloading and transferring the heavy machinery for the Power House. The several tracks serving the storage and the derrick are indicated on the plan by the reference number 55.

Canal Crossings.

Branching in a south-easterly direction from the north-bound main construction track at Station 49, a track denoted by the numeral E was constructed, crossing over the canal site at an angle of 62 degrees and extending a distance of 2,500 feet. From this track a switch connected with the track emerging into the rip-rap track along the easterly bank of the Canal. Two other crossings were made, one at Station 60 and the other at Station 85, connecting the rip-rap tracks on the east and west banks of the Canal. All three crossings were subsequently removed to permit of the operation of the suction dredge. In lieu of these three crossings a more permanent cross-over was constructed at Station 136, shown on the plan by the reference

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number 28. This was a right angle crossing carried over the Canal on a steel plate girder span and connecting with the northbound main construction track by "Y's", denoted by the numeral 35, to the north and to the south. At the east side of the Canal a "Y" to the north connected with the rip-rap track at the top of the bank.

At Station 398 the track shown on the plan by the reference number 39 was carried over the Canal to form a junction with the track denoted by the numeral 90 on the westerly side of the Canal.

Miscellaneous Tracks.

In addition to the foregoing tracks there were many sidings and crossover tracks built for specific purposes, reference to which will be found in the table giving the length of track in the system.

Equipment.

The equipment of the railway system consisted generally speaking of twenty-four electric locomotives, twenty-two steam locomotives, three hundred and nineteen dump cars, and about fifty other cars together with cranes and other miscellaneous rolling stock. The fourteen photographs shown on pages H-74 to H-80 show clearly the type of equipment used. Equipment was purchased as the needs of the work asserted themselves, the first important order being placed on March 29th, 1917.

WALTER J. FRANCIS & COMPANY.

COPY FOR ENCLOSURE TO Mr. J. Allan Ross.

To face page 11-74

No. H-31

Photograph showing

Typical 40-ton Steam Locomotive.

Taken November 7th, 1919.

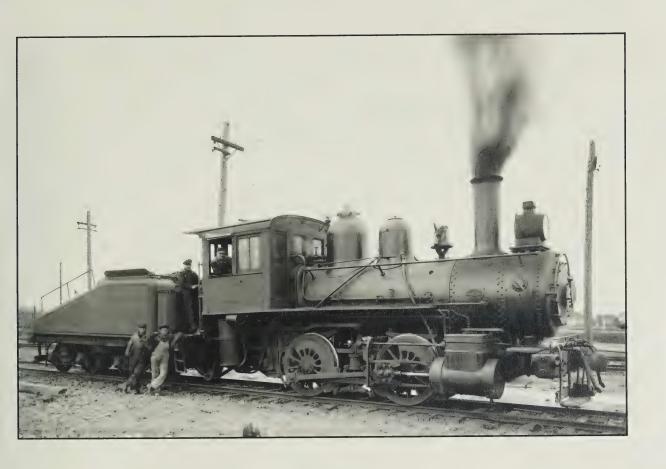
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No. H-32

Photograph showing

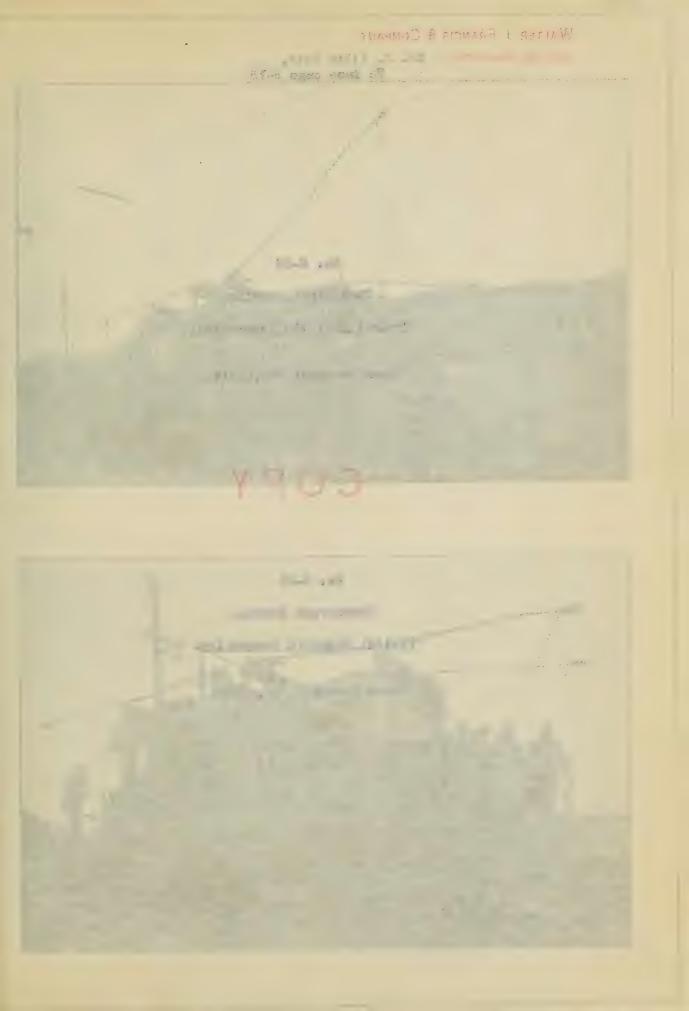
Typical Saddle Tank Locomotive.

Taken October 5th, 1920.









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To face page H-75

No. H-33

Photograph showing

Typical Electric Locomotive.

Taken November 6th, 1919.

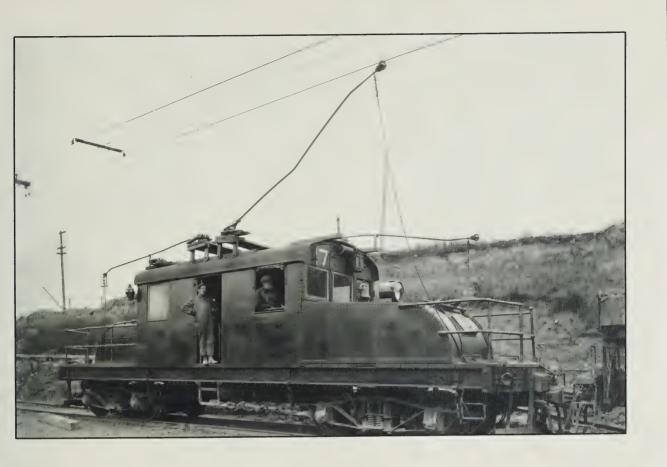
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No. H-34

Photograph showing

Typical Mectric Locomotive.

Taken November 7th, 1919.







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To face page H-76

No. H-35

Photograph showing

Typical lectric Loromotive.

Taken June 3rd, 1919.

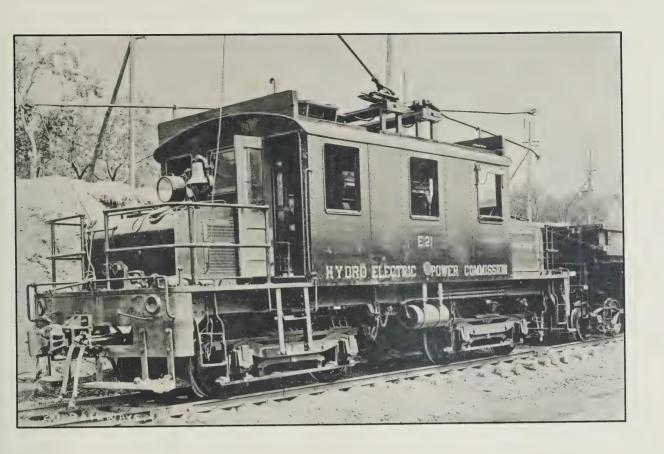
COPY

No. H-36

Photograph showing

Typical Electric Locomotive.

Taken November 7th, 1919.









COPY FOR ENCLOSURE TO Mr. J. Allan Ross.

To face page H-77

No. H-37

Photograph showing

Under Side of Typical Standard Steel 20-yard Dump Car.

Taken March 7th, 1919.

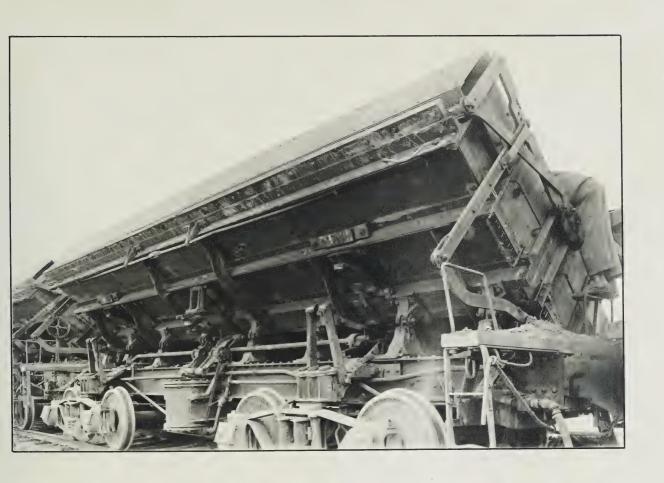
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No. H-38

Photograph showing

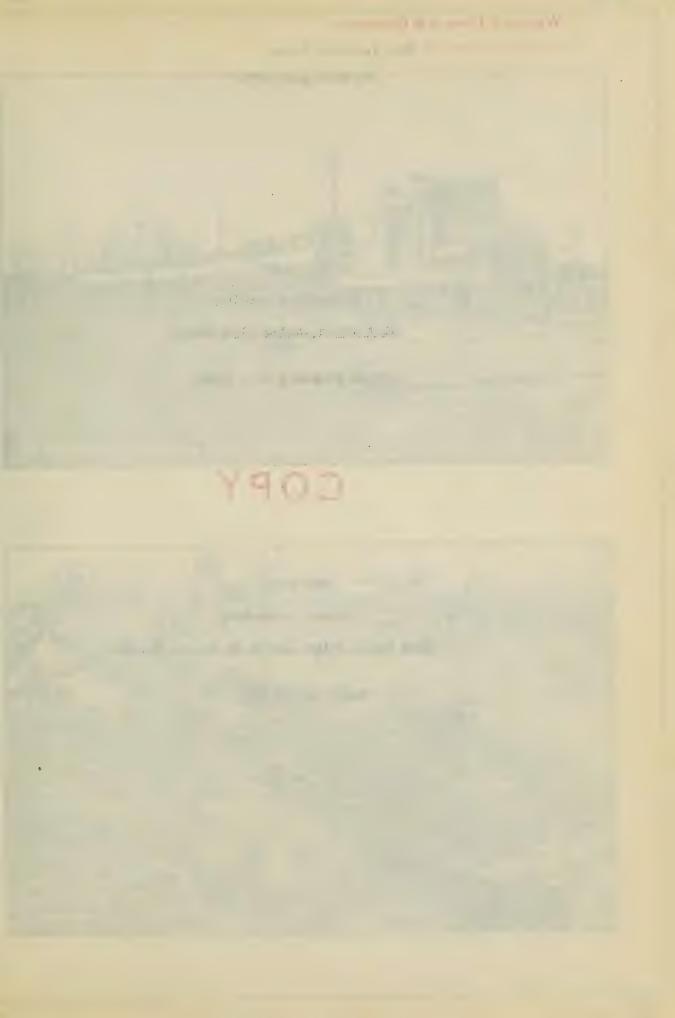
Standard Steel 20-yard Dump Car.

Taxen November 6th. 1922.









COPY FOR ENCLOSURE TO Mr. J. Allan Ross.

To face page H-78

No. H-39

Photograph showing

Dirt Erain Loaded with Earth-

Taken February 6th, 1919.

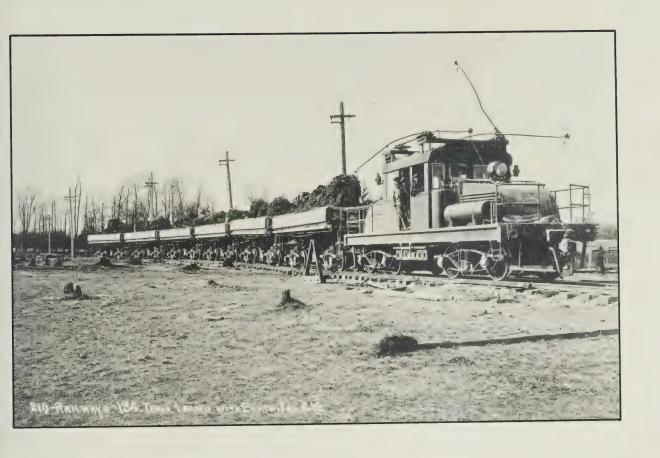
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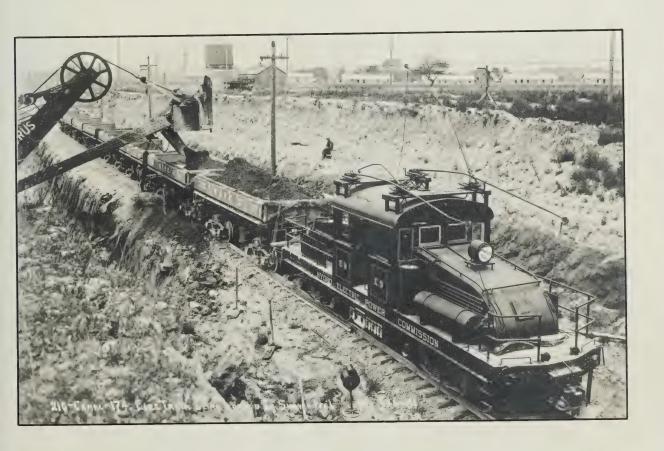
No. H-40

Photograph showing

Dirt Train Being Loaded by Shovel No. 1.

Taken August 7th, 1918.









COPY FOR ENCLOSURE TO Mr. J. Allan Ross.

To face page H-79

No. H-41

Photograph showing

75-ton Locomotive Crane.

Taken November 7th, 1919.

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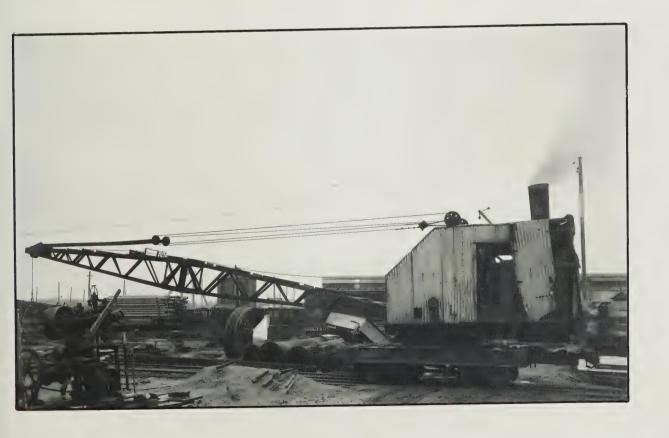
No. H-42

Photograph showing

23-ton Logomotive Crane.

Taken November 8th, 1919.







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COPY FOR ENCLOSURE TO Mr. J. Allan Ross.

, To face page H-80

No. H-43
Photograph showing

Takan November 7th, 1919.

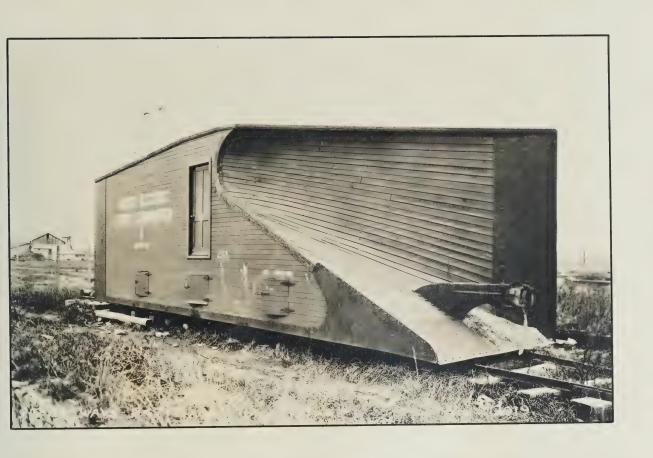
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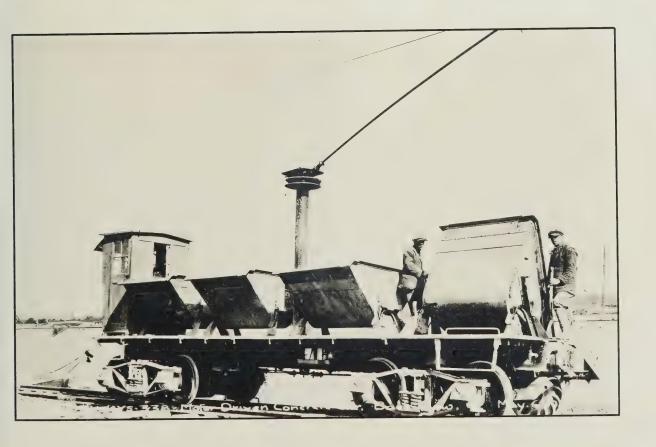
No. H-44

Photograph showing

Motor-driven Concrete Car.

Taken May 6th, 1921.







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In addition to the rolling stock there were one coal dock, one coal trestle, one locomotive shed, one car repair shop and miscellaneous storage sheds.

The following is a list of the principal items of railway equipment:

Munber		Description
24	No like within	Electric Locomotives Steam Locomotives
319	The district of the state of the state of	Dump Cara
26 16 :::		Flat Care
4.		Gondola Care Fassenger Coaches
3		Trolley Cars
4	COP	hand Cars
11	001	Galsoline Speeders Concrete Mixer
1	A	Snowplough Wrecking Crane
7	3.7 (3.4) 2 (3.5 fb). (1.5 fb).	Railway Cranes

Machine Shop.

The machine shop, or more correctly the repair shop, was located at the Whirlpool yards. In addition to its capacity for making the usual repairs to the rolling stock, the shop was also equipped with machines, forges and so forth to enable emergency repairs to be made to practically every part of the construction plant.

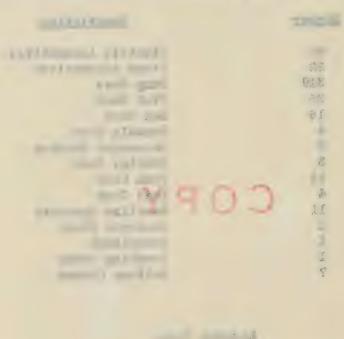
Maintenance and Operation.

The system was laid out by the field engineers, and constructed under

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the following to a liet of the principal items of railway equipment:



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 the direction of the Superintensient of Lailway Construction and Maintenance. The organization of the Railway Superintendent's department has already been set forth in Chapter F. Organization. The operation and maintenance, as well as the subsequent removal of the trackage also came under the jurisdiction of the same officer.

The "Train Sheets", already referred to in the opening paragraph of this description of the Construction Mailway, were in a wealth of detail, giving the engine number, the description of the train, class of loading, the time of passing the principal stations and much other pertinent information.

COPY

DISPOSAL AMBAS.

General.

There were in all sixteen disposal areas in connection with the construction work of the Queenston-Chippawa Power Development. These areas are shown on the topographical map included herewith as page H-35 and in greater detail on the succeeding page H-84 on the map showing location of disposal areas.

Pive of the areas, being those denoted by the letters L. M., N., O., and P., were used for the excavation of the Canal. The areas marked A. B. C., D. E. F. G. H. J. K and K2 were used for disposal of spoil from the Intake and the Welland Eiver, while the area marked 2 received the spoil from the site of the Power House, and will be referred to in the third part of this Chapter.

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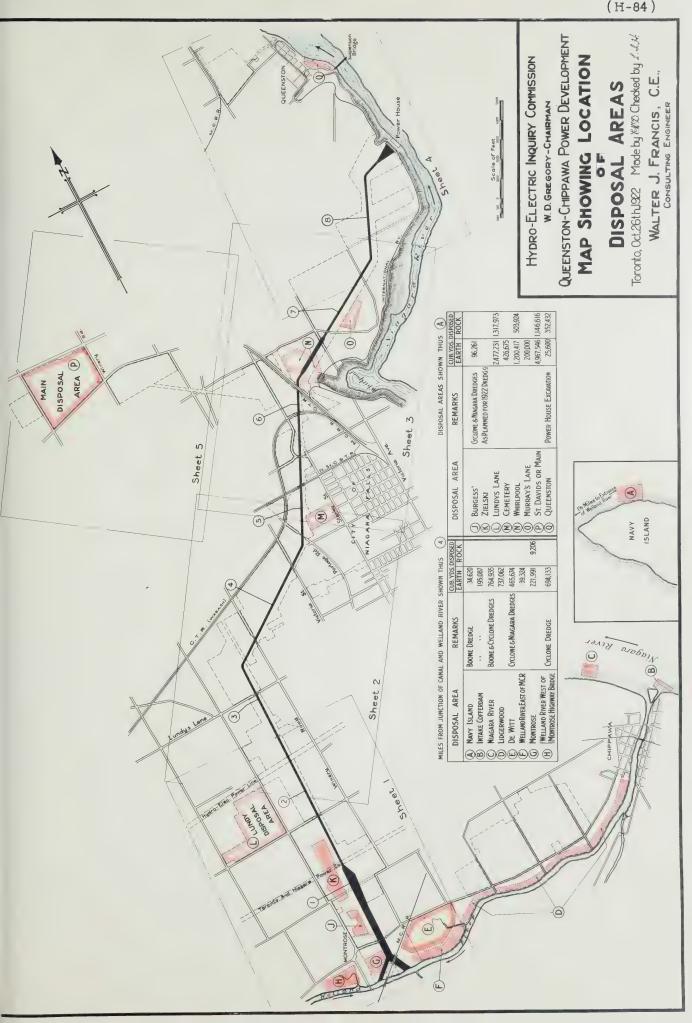
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The area denoted K2 on the topographical map was projected as shown by the dotted line outside of the area K, but was not used.

The names and designating marks of the disposal areas used for the Canal excavation, together with the quantities deposited therein, are as follows:

Disposal Area		Cubic Yards	Deposited Nock
(L)	Lundys Lane	2,477,231	1,317,972
(M)	Gemetery	426,675	**
(N)	Whirlpool	1,200,417	503,924
(0)	Murray's Lane C.O.P.Y.	200,000	***
(P)	St. David's or Main	4,967,546	1,145,615

The disposal area at Queenston marked Q took 25,600 cubic yards of earth and 352,432 cubic yards of rock.

Lundys Lane Disposal rea.

Landys Lane disposal area formed part of Lots 163 - 170 of the Township of Stamford. Four tracks were carried over this area on temporary trestles from which spoil was distributed. Speaking generally, the Lundys Lane disposal area received the spoil from the scutherly side of the slope of land which is crossed by the Canal near the public highway of the same pame. The natural surface of the site varies from Elevation 600 to 625 and is the lowest available land in proximity to the Canal. The natural

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surface at the crossing of the Canal with Lundys Lane is at Elevation 665, and the bottom of the Canal at the same point is Elevation 520.

A view of Lundys Lane disposal area is given by photograph No. H-48, being the lower picture on page H-68 hereof. The upper picture on page H-89 hereof, being photograph No. H-49, shows a train on the Lundys Lane disposal area.

Cemetery Disposal Area.

The Cemetery disposal area lies in the southeast corner of Lot 71 in the County of Stamford. In it there were deposited 426,675 cubic yards of earth, carefully levelled, and given in the carefully levelled, and given in the morth used for construction purposes.

Whirlpool Disposal Area.

The Whirlpool disposal area served the double purpose of disposal and permanent construction. It formed the floor and the embankments of the canal crossing over the Bowman's Gully depression. In it were placed 1,200,417 cubic yards of earth and 503,924 cubic yards of rock.

A view of the Whirlpool disposal area is given by photograph No. H-47, being the upper picture on page H-88 hereof. A second picture is included herewith as photograph No. H-46, being on page H-87 hereof.

Murray's Lane Disposal Area.

The Murray's Lane disposal area was opened as an emergency disposal, and

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To face page H-87

No. H-45

Photograph showing

General View of meanston Disposel Area.

looking north.

Taken May 6th, 1920.

COPY

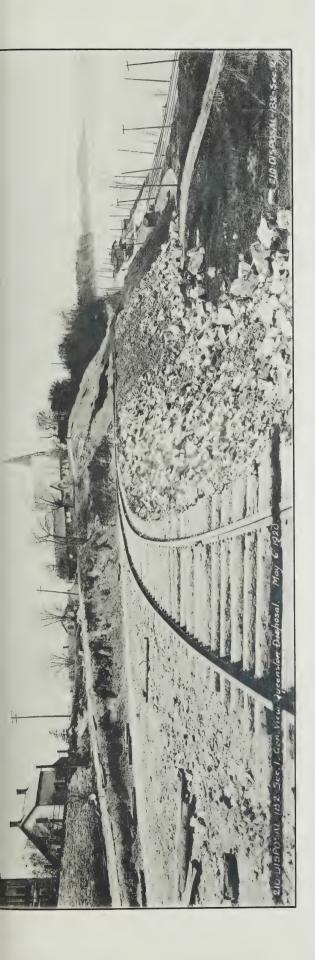
No. H-46

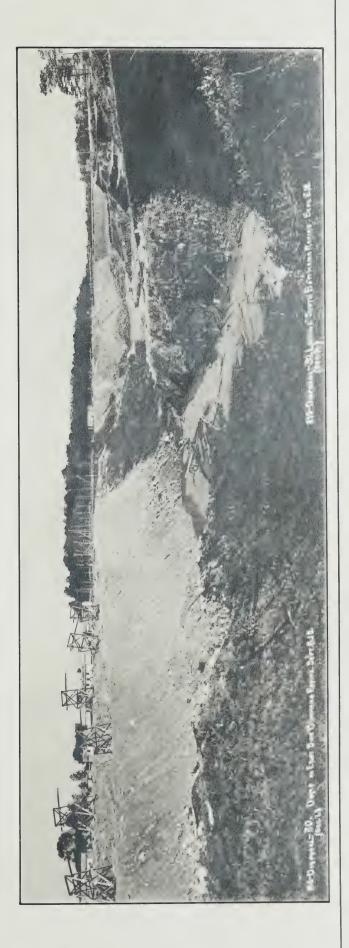
Photograph showing

Whirlpool Disposal Area.

looking southerly.

Taken September 6th, 1918.







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COPY FOR ENCLOSURE TO Mr. J. Allan Ross.

To face page H-88

No. H-47
Photograph showing

Whirlpool Disposal area.

COPY

No. H-48

Photograph showing

Lundya Lane Disposal Area







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COPY FOR ENCLOSURE TO Mr. J. Allan Ross.

To face page H-89

No. H-49

Photograph showing

Dirt Train on Lundys Lane Disposal Area.

Taken October Srd. 1918.

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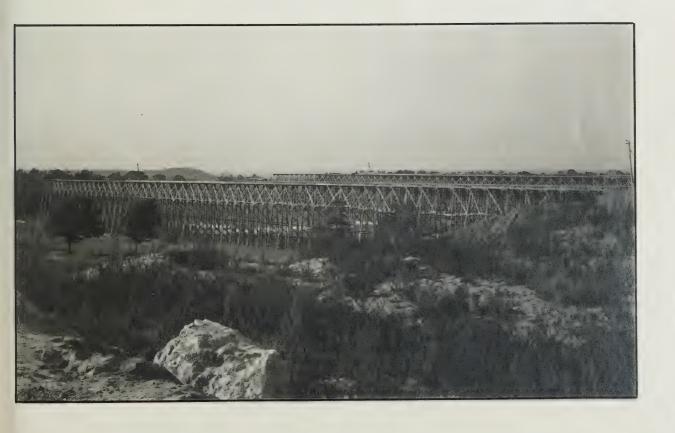
No. H-50

Photograph showing

Trestle Work on Main Disposal Area.

Taken October 7th, 1920.







200,000 cubic yards of earth were deposited therein. The Whirlpool disposal area had been filled by the middle of January, 1919. Negotiations for the proposed crossing of the Grand Trunk Railway main line tracks were opened and continued for mineteen months, the crossing being finally obtained on Pebruary 20th, 1919. During the six weeks between the two above-mentioned dates, the Eurray's Lane area was used.

St. David's or Main Disposal.

The St. David's or hain disposal area consisted of Lot 15 and part of
Lots 526 and 14 in the County of Stamford and is located at the crest of the
escarpment. The main track Cealing to if terminated in six spur tracks
carried over the area on temporary unloading treatles. It received 4,967,546
cubic yards of earth and 1,146,616 cubic yards of rock. The general surface
of the land lying between the main disposal area and the Canal is about Elevation 625.

A view of the Main disposal area and some of the trestlework thereon is given by photograph No. H-50, being the lower picture on page H-69 hereof.

Queenston Disposal Area.

The material from the Power House excavition, amounting to 25,600 cubic yards of earth and 352,433 cubic yards of rock, was deposited in the depression along the water's edge of the Biagara River at the place marked "Q" on the plans. Special tracks were laid over the area from which the material was unloaded and distributed.

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A view of the Queenston disposal area is given by photograph No. H-45, on page H-87 hereof.

Malter Francis'
Consulting Engineer.

Toronto, March 5th, 1923.

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